DOCUMENT RESUME

ED 344 677 PS 020 491

AUTHOR Clyde, Margaret; Ebbeck, M. A.
TITLE Teacher Development: A Comparative Study of Early Childhood Teachers in Their First Year of Teaching 1988-90.
PUB DATE 91
NOTE 22p.; Paper presented at the AARE Conference (Queensland, Australia, 1991).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Beginning Teachers; *Child Care Occupations; Comparative Analysis; Day Care Centers; Early Childhood Education; Foreign Countries; *Job Satisfaction; Kindergarten; Longitudinal Studies; *Preschool Teachers; School Surveys; Self Evaluation (Individuals); *Teacher Attitudes; *Teacher Morale
IDENTIFIERS Australia

ABSTRACT

A study of graduates of the de Lissa Institute of Early Childhood Studies and the School of Early Childhood Studies (SECS) at the University of Melbourne in Australia identified changes in the professional attitudes of teachers during their first year of teaching. Early childhood teachers working in junior primary schools, preschool kindergartens, or child care centers were surveyed three times over a 1-year period. The sample, which included a cohort of graduates from each school for the years 1988, 1989, and 1990, was composed of 42 SECS graduates and 23 de Lissa graduates. The survey solicited the teachers' perceptions of: their authority, status, and job satisfaction; their colleagues; and their own performance. It was found that in three of the six cohorts, teachers were more inclined to feel lack of authority and status during the second term than during the first or third terms. Members of five of the six cohorts indicated that they were happy with their jobs by the end of the third term. Respondents became increasingly positive about their colleagues' work during the course of the year. For five of the cohorts, there was a second-term increase in the number of teachers agreeing that "the school/center expects too much of a beginning teacher." The number who agreed decreased in the third term. Responses to the Fuller Teacher Concerns Survey revealed a strong move toward professional maturity by the third term. (AC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED344677

TEACHER DEVELOPMENT : A COMPARATIVE STUDY OF EARLY CHILDHOOD TEACHERS IN THEIR FIRST YEAR OF TEACHING 1988-90.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Margaret Clyde

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

PS 020491

Margaret Clyde
Principal Lecturer in
Early Childhood Studies
University of Melbourne
Kew Victoria

Professor M.A. Ebbeck
Dean, Magill Campus
University of South Australia
Magill S.A.

AARE Conference 1991
Surfers Paradise

BEST COPY AVAILABLE

Background Information

Over the past decade or so, a great deal of effort, expertise and time have been devoted to looking at the preparation of teachers by the higher education sector in Australia. This veritable growth industry has not been confined to Australia however, as the OECD (1989) produced a report which suggested that while reform in the area of teacher education remains:

> "partial and controversial ... the challenge is to balance competing policy objectives, institutional approaches and traditions and the nature of teacher's work in ways that both improve the responsiveness and quality of teacher education and enhance the status of the profession". (p 2)

The Australian scene has witnessed the release of substantial reports on teacher education in the past two or three years, all pointing the way for reform. An NBEET Report (1990:1) summarises the following reports: Teacher Quality: An Issues Paper published by the Schools Council in November 1989, Discipline Review of Teacher Education in Mathematics and Science published by DEET in October 1989 and Teacher Education in Australia, an AEC Working Party paper published in July 1990.

This overall report makes the point that:

> "Improving teacher quality continues to be one of the most intractable policy questions in Australian education. While there is agreement about why it should happen and on the benefits that will follow, there is no agreement about how it should happen".
>
> (1990:1)

The Report identifies seven common issues which are included in all three previously published reports, namely :

* the quality of preservice education including its length and content
* the structure of preservice education
* financing practicum supervision
* induction of new teachers
* the need for a national professional body
* inservice education and
* co-operative arrangements

While all these items are of great concern in an education system which is undergoing rapid and broad change, this paper will concentrate on the issue of the induction or mentoring, or inservice education of beginning teachers; the second phase of teacher training for the beginning teacher.

The OECD Report of 1989 mentions that in Australia we have no fixed pattern of induction per se, although informal procedures are in place in many schools, however:

> "Induction and mentoring for teachers at the time of their first professional experience is considered essential if the new teacher is to fit effectively into a new teaching team ... the government of the United Kingdom ... recommends the strengthening of induction". (OECD, 1989:2)

In support of this process the Speedy Report, Discipline Review of Teacher Education in Mathematics and Science, (1989), commented that it is a "quantum leap from being a pre-service teacher education student to taking responsibility for a full time classroom environment". (p 123)

The Report argues that the variable conditions experienced by the beginning teacher often result in the teacher's first few months in the classroom being a "baptism of fire" in which the teacher is left on his or her own to "sink or swim". While the metaphor is mixed, the message is clear; we must do more to support beginning teachers so that their induction to the profession is a positive one in a supportive environment in which continued learning is a positive, rather than a negative experience.

A Queensland study of beginning teachers (Lennon et al, 1988) found that beginning teachers appreciate a high level of support from the administration in relation to their own level of development including :

* planned induction programs based on further professional development
* the appointment of professional tutor or mentor positions charged with the responsibility of attending to the induction needs of beginning teachers
* a school induction process which supports professional development programs and networks sponsored by institutions and, in addition,
* induction programs planned on an individual basis in recognition of the different needs of neophyte teachers.

Fogarty and Lennon (1991) .elaborated further on these ideas for improving induction experiences, including the notion that teacher education institions should offer systematic follow-up efforts to evaluate the quality of its graduates, and presumably, to determine the success or otherwise of their transition from the first phase of teacher training, the preservice program, into the second phase, that of the professional development of the neophyte teacher.

The Study

In the light of the material being disseminated in the various Australian and international reports, members of staff at the de Lissa Institute of Early Childhood Studies of the then SACAE, and staff at the School of Early Childhood Studies, University of Melbourne, undertook the task of trying to identify the needs of neophyte early childhood graduates in their first year of working in Junior Primary Schools, Preschool Kindergartens or Child Care Centres. Both qualitative and quantitative data were generated, through a questionnaire administered three times during the first year and the use of Fuller's TCS (Teacher Concerns Survey) also administered on three occasions. A suitable questionnaire existed (Gilding, 1980) which was piloted and adapted for use in this study, while Borthwick (1989) has argued that Fuller's model, expounded over twenty years ago in her paper entitled "Concerns of Teachers: A Developmental Conceptualisation", encompasses concerns of an extremely durable and relevant nature; Borthwick argues that the process proposed by Fuller, namely inviting participants to respond to the question : "when you think about your teaching, what are you concerned about?" continues to be widely cited in the literature and is therefore an appropriate method for identifying teachers' concerns.

The study looked at beginning early childhood teachers in two states in each of three separate cohorts, 1988, 1989 and 1990. This paper reports on the results of the three years of data. For the purposes of this paper the data on the neophyte teacher's perceptions of the pre-service course have been omitted and the data from key questions relating to the first twelve months in the field have been analysed, together with the Fuller TCS material.

Respondents were asked to circle the most appropriate response to a number of questions relating to their perceptions of professional life as a teacher or child care worker. Choices on the Scale were (1) "very true", (2) "fairly true", (3) "not sure", (4) not really true", (5) "no, not true at all", and (6) "not applicable". A "no response" category was included in the coding.

The questions selected for discussion in this paper are as follows :

Items 89 - 101:

89 I don't feel I have any real authority in my job

90 I don't feel I have any real status in my job

91 I'm really happy with my job as a teacher

92 I wish accommodation/transport weren't such a bother

93 the staff here really care about their work

94 at this school/centre the Director/Principal/Administration makes the decisions

95 this school/centre expects too much of beginning teachers

96 the school/centre staff have really made me feel at home

97 the staff here are really concerned about the children

98 I'm so busy I don't know which way to turn

99 this period of teaching has been a real struggle to survive

100 this period has been a period of growth and development for me

101 I think I have performed well in this period of teaching

Results

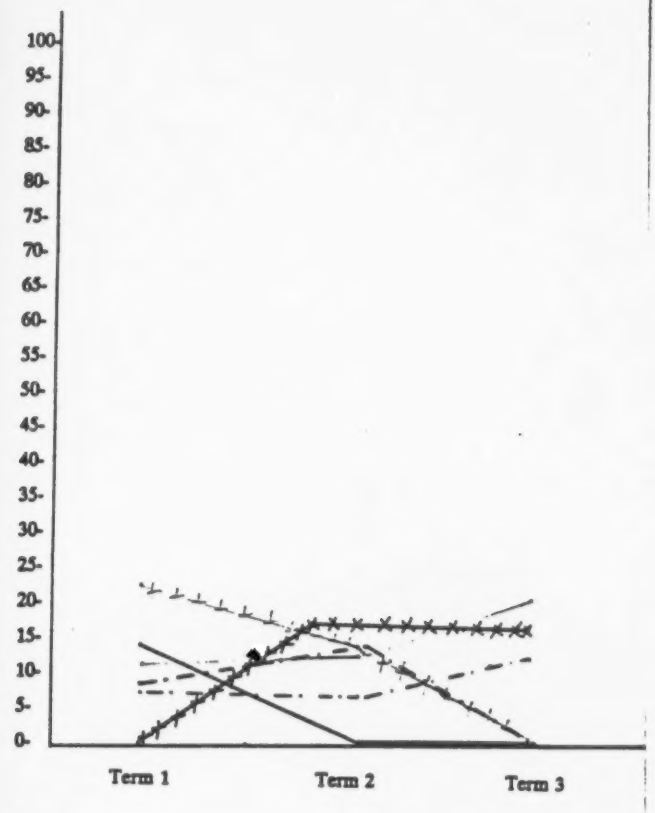
The cohorts were made up of the following :

1988:	SECS	14	most graduates worked in kindergartens; one was in child care
	de Lissa	6	working in child care, kindergarten and junior primary
1989	SECS	9	all working in kindergarten
	de Lissa	5	working in kindergartens, an aboriginal rural school and a child care centre
1990:	SECS	19	all working in kindergartens
	de Lissa	12	working in child care, kindergarten, junior primary and out of school hours care

It should be noted that not all respondents had positions in their original state; several de Lissa graduates had positions in New South Wales while two SECS graduates were working in New South Wales and Queensland respectively.

The results of the questionnaire are presented in toto, in the Appendix. The responses to 1 and 2, namely "very true" and "fairly true" are presented on the following graphs:

Item 89
I don't feel I have any real authority in my job

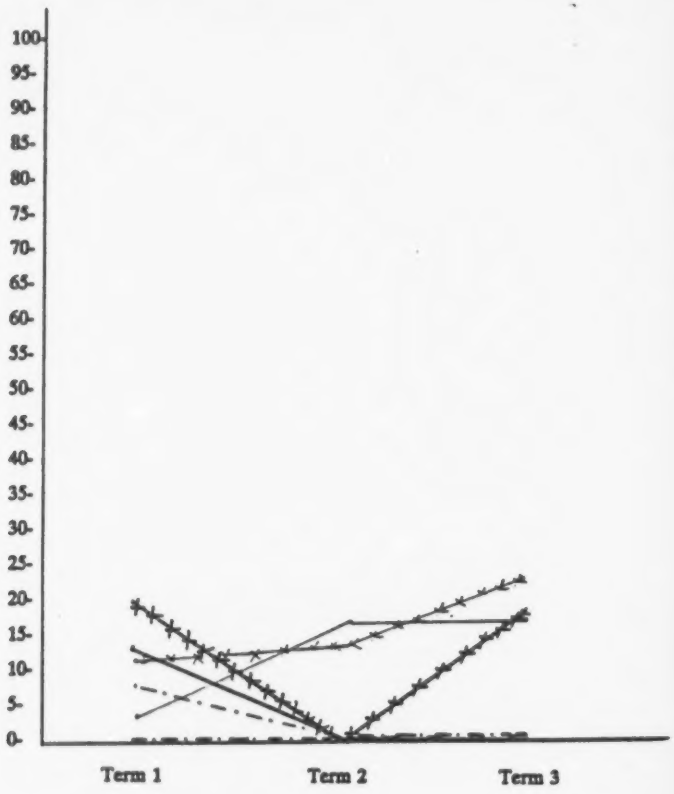


Key

Vic 1988 ——
1989 ✳✳✳
1990 — · —

SA 1988 ——
1989 ✳✳✳
1990 —·—

Item 90
I don't feel I have any real status in my job



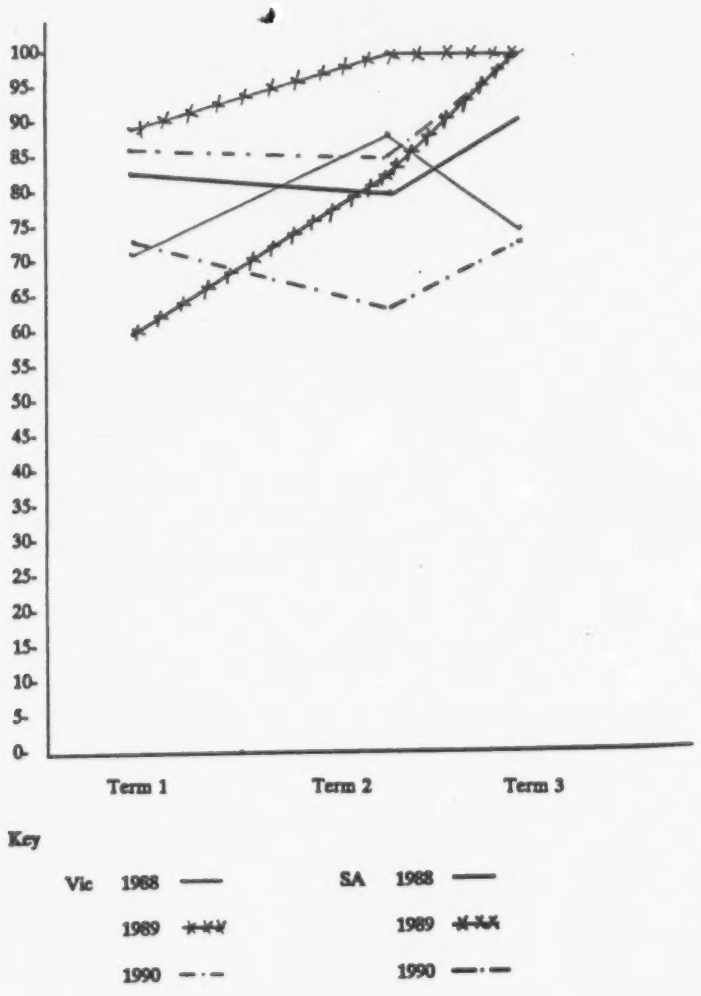
Key

Vic 1988 ——
1989 ✳✳✳
1990 — · —

SA 1988 ——
1989 ✳✳✳
1990 —·—

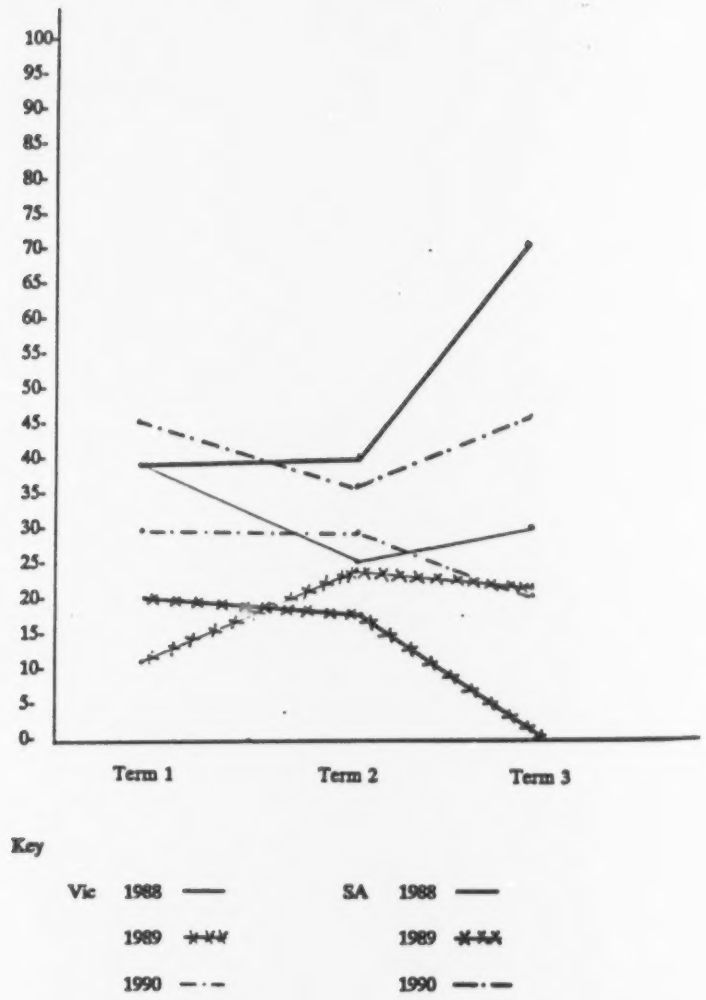
Item 89-90; these two items have a similar thrust and therefore could be expected to elicit similar responses, with the number of responses to "very true" and "fairly true" diminishing over time as the beginning teachers became more familiar with their various roles and gained in confidence and competence. The results across the six cohorts are not regular in this regard, but as the numbers are small it would not be appropriate to read too much into them; however it should be noted that for Item 89 three of the six cohorts registered an increase in support of these statements in second term, possibly indicating a crisis in confidence in their ability to cope.

Item 91
I'm really happy with my job as a teacher

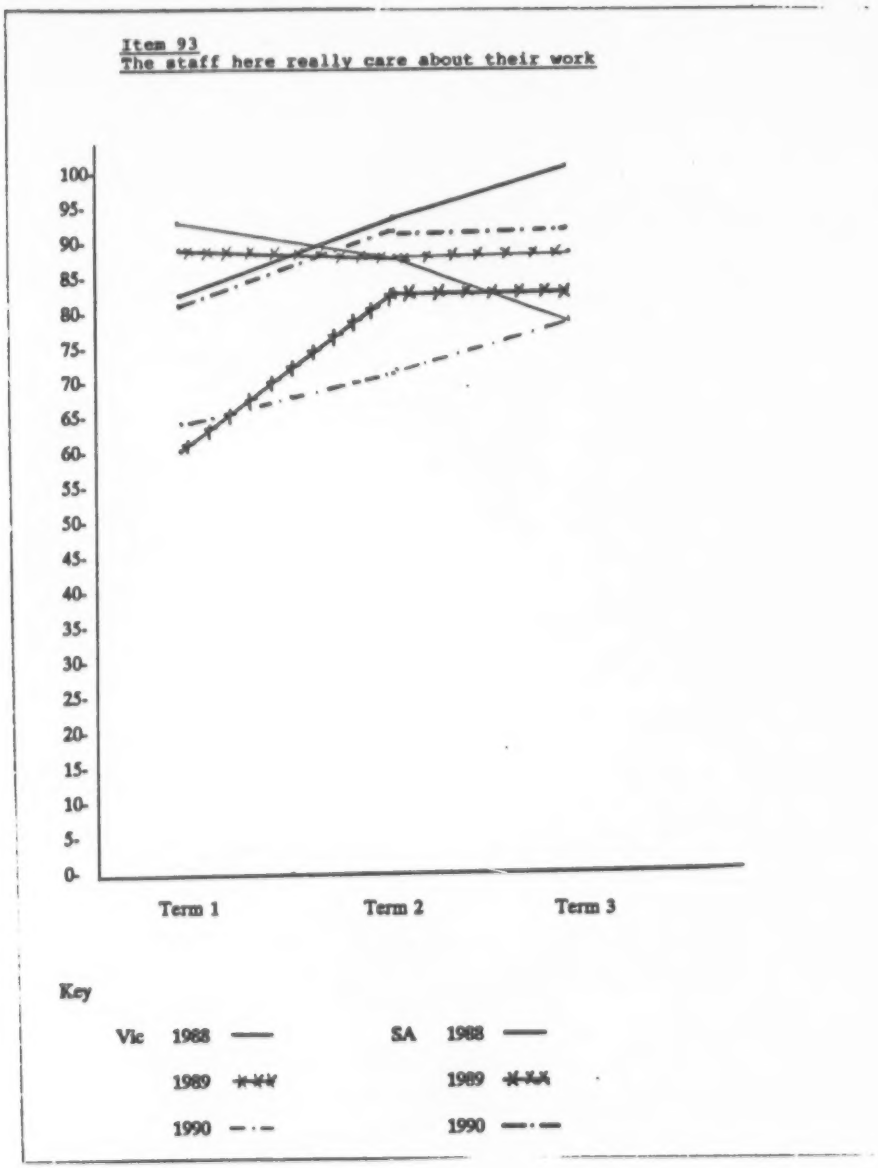


Item 91 related to the neophyte's feelings about being a teacher; most groups, five in fact, indicated that this was true - at least by the end of the year. The 1988 Victorian cohort was the only group to register a diminition from term 1 to term 3 and it had registered an uncharacteristic increase in term 2. It would appear that several members of that cohort had concerns that were not typical of the other groups; the Fuller TCS may shed some light on the ideosyncratic nature of that group.

Item 92
I wish accommodation/transport weren't such a bother

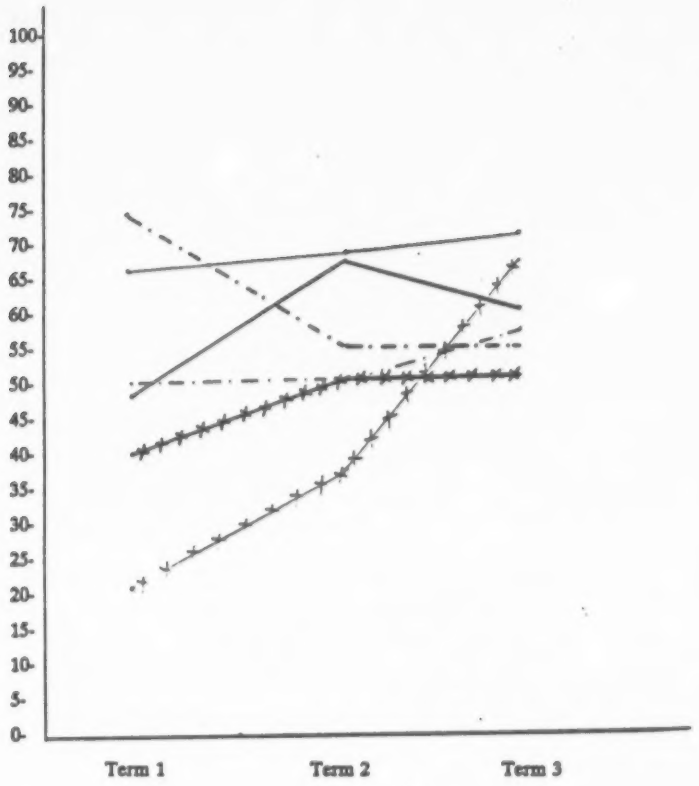


Item 92, relating to transport and accommodation arrangements, is meant to reflect the respondants' general feelings about their role; however with several of the respondants in both states living and working away from their home state, and presumably their support bases, the results could be interpreted as a real reflection of their need to establish themselves in new environments. This is possibly the case with the 1988 and 1989 South Australian cohorts, who had several members relocating interstate or in country areas.



Item 93 is one of two questions (along with Item 97) which indicates the beginning teachers' perceptions of their professional colleagues work; the responses become more positive as the year progresses, with the exception of the 1988 Victorian cohort, and could be seen to reflect the neophyte teachers' growing awareness of the situation in which they are operating, and their own place in the process. It is interesting to reflect that apart from the 1988 Victorian cohort, there are no mid-year crises of confidence!

Item 94
At this school/centre the Director/Principal/Administration makes the decisions



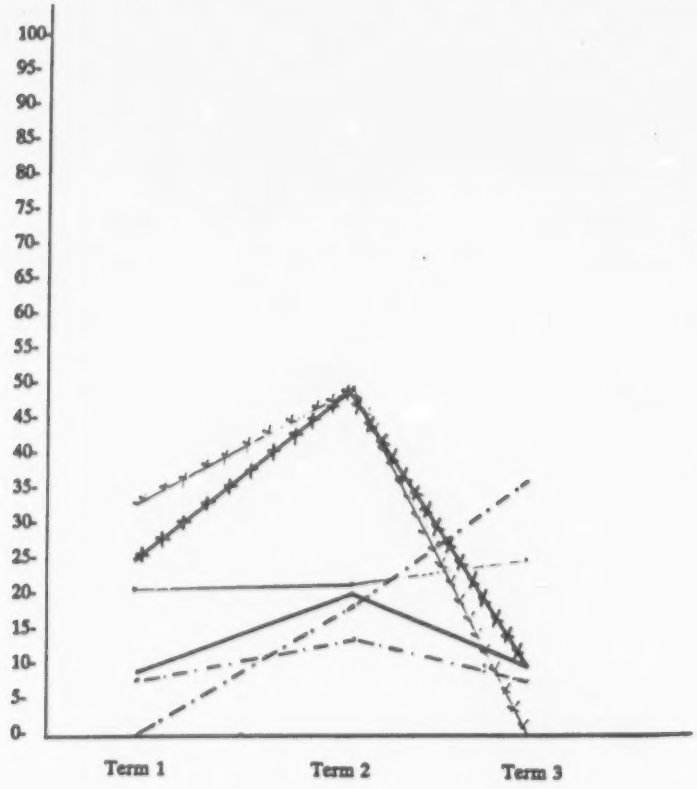
Key

Vic 1988 ——
1989 +-+-+
1990 — · —

SA 1988 ——
1989 +-+-+
1990 —·—

Item 94 however suggests that there is a growing belief that the "administration" is the decision-maker at their place of work; there are two different interpretations - and implications - of this response; one is that as the beginning teacher develops a greater awareness of the organisation and management processes of their centre or school they perceive themselves as less in control of their own destiny, and that they are unhappy about this; a second, and more obvious response for the Victorian cohorts at least, is that they are themselves in charge of single unit centres, and are indeed in charge of the entire operation, but believe that the kind of support and advice they require in order to fulfil this demanding role is not forthcoming. This second option is supported by comments on the TCS, particularly the 1989 Victorian cohort.

Item 95
This school/centre expects too much of beginning teachers



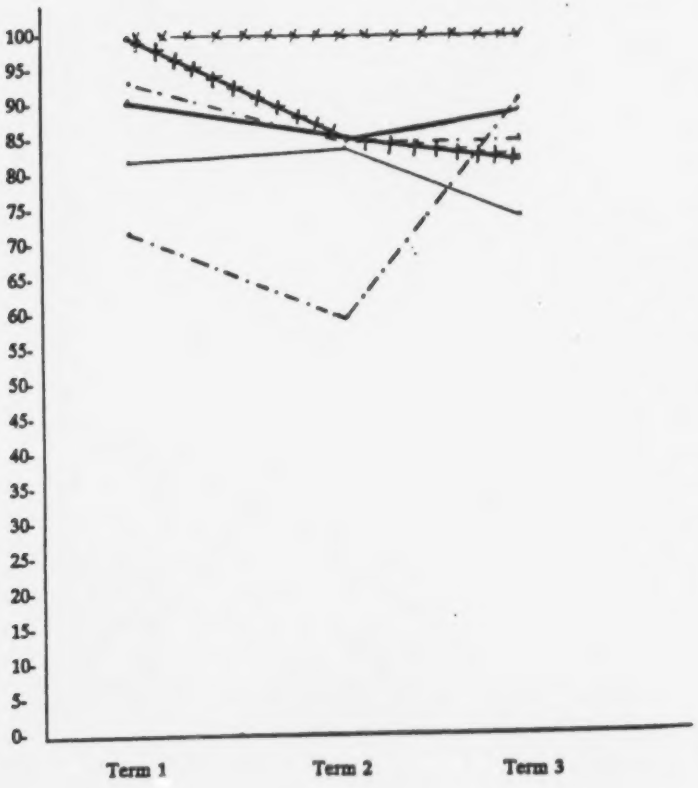
Key

Vic 1988 ——
1989 +-+-+
1990 —·—

SA 1988 ——
1989 +-+-+
1990 —·—

Item 95 is the key question, inviting respondants to indicate their perceptions of the school or centre's expectations of beginning teachers. Hopefully the "very true" and "fairly true" responses will decline as the year progresses and this was the case, apart from the 1990 South Australian cohort. The twelve respondants were an atypical group working across a number of positions including out of school hours care, centre based child care, preschool and junior primary positions, often in short contract roles, and none of them was permanent. The casual and/or less than first choice nature of these positions could have coloured the responses. However the responses reveal some kind of increase in agreement with this statement in second term which appears to be the critical time when support is most needed by the neophyte teacher.

Item 96
The school/centre staff have really made me feel at home



Key

Vic 1988 ——
1989 +-+-+
1990 — · —

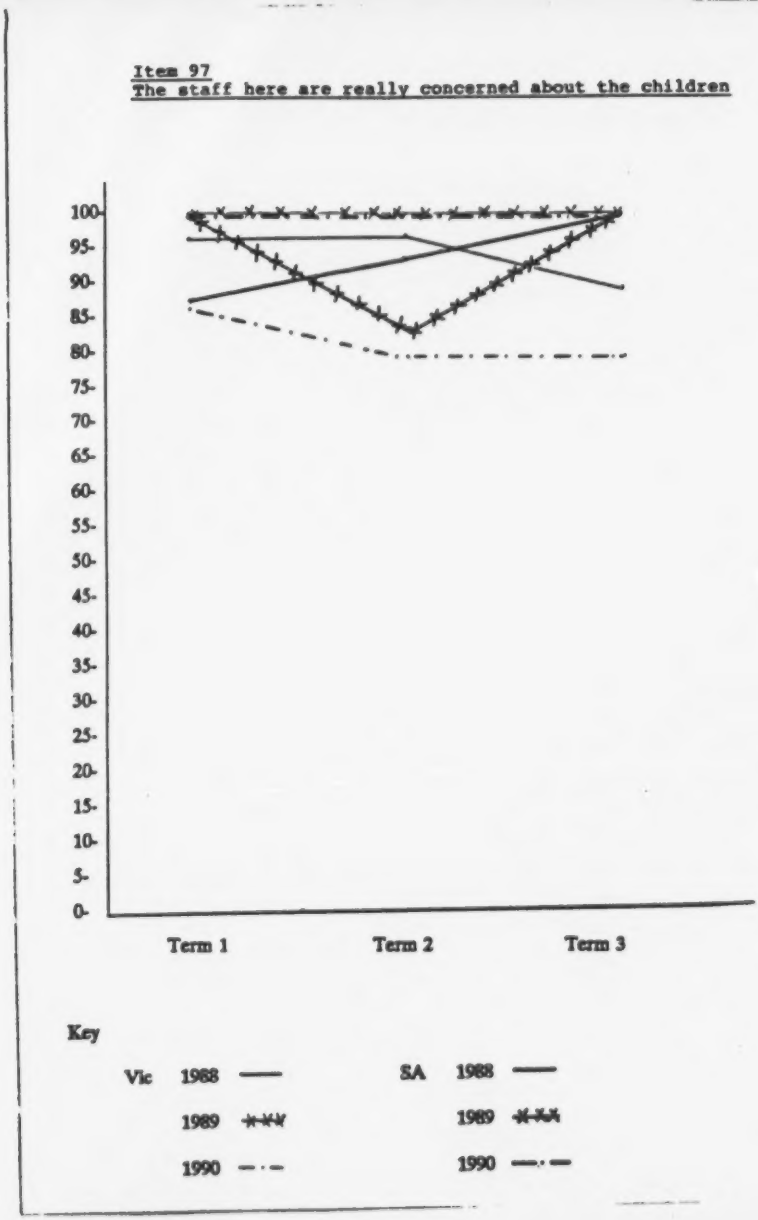
SA 1988 ——
1989 +-+-+
1990 — · —

Item 96 relates to the way in which the "new chums" believe they have been accepted into the teaching profession. Several of the cohorts appear to have suffered from second term crises of confidence in this regard, although for the 1989 South Australian cohort it possibly reflects the part time nature of the group and the fact that several had taken up new positions in second term and had as a result begun a new neophyte phase.

The professional isolation of the early childhood teacher is reflected in the following comment from a member of the 1989 South Australian cohort :

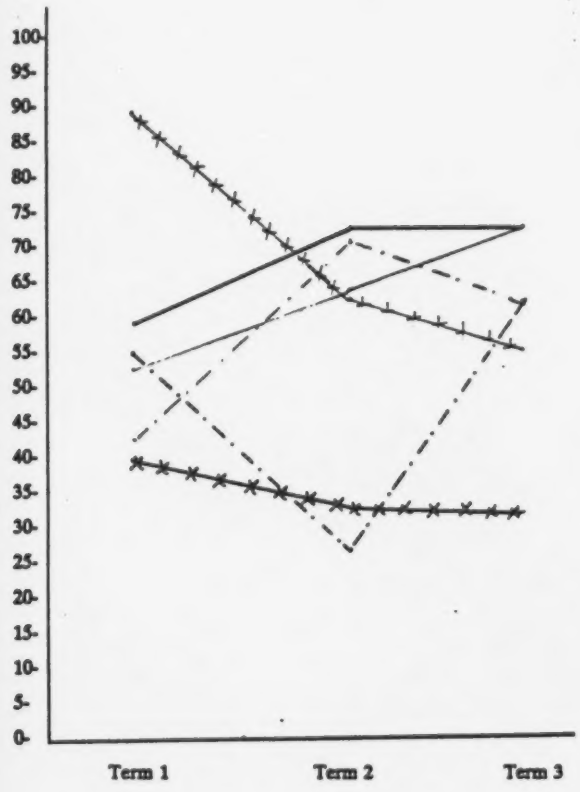
> "What can you do about an experienced (kindergarten) assistant who is very capable but does not want to change?"

As the new teacher and the assistant would constitute the entire "staff" one can only speculate about whether that new teacher ever felt the "staff" made her feel "at home" in the course of the year.

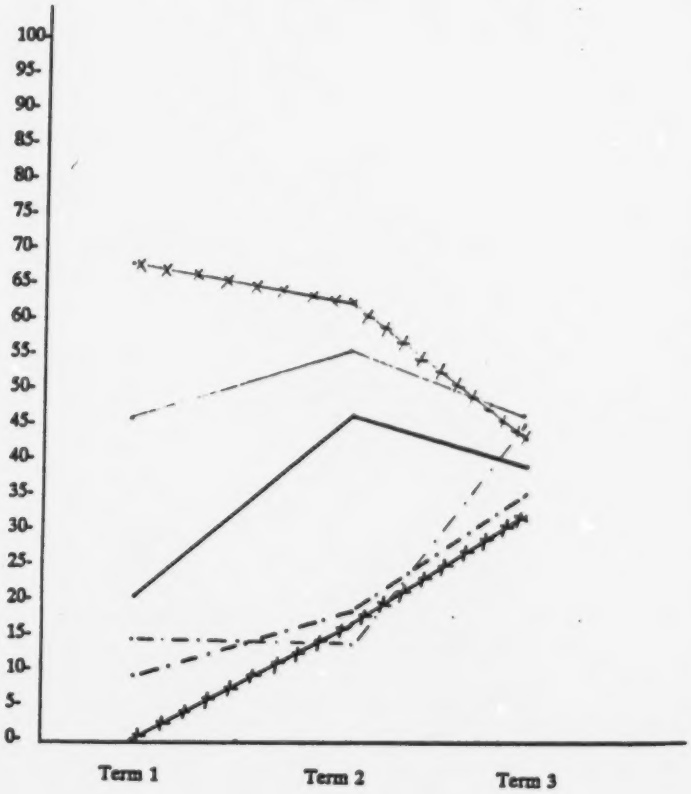


Items 97 and 93 are linked as they reflect the neophyte's perceptions of her colleagues role; strangely the two sets of responses are not similar apart from the 1988 South Australian cohort, and two groups report lessening of confidence on this critical area in second term. Hopefully this is only an indication of "mid year uncertainty", although it appears to be increasingly persistent for the 1988 Victorian cohort. As the vast majority of the cohort were working in small kindergartens this can only seem to reflect their perceptions of their assistants' behaviour, as no other staff is employed. Such a situation for a beginning teacher, who perceived a lack of outside assistance in controlling such a situation, is an intolerable burden for an inexperienced teacher, and one which highlights the peculiar responsibilities of inexperienced early childhood teachers, as opposed to the vast majority of their colleagues at primary and secondary levels who normally operate in much larger professional groupings.

Item 98
I'm so busy I don't know which way to turn



Item 99
This period of teaching has been a real struggle to survive



Key

Vic 1988 ——
1989 ✳✳✳
1990 — · —

SA 1988 ——
1989 ✳✳✳
1990 —·—

Key

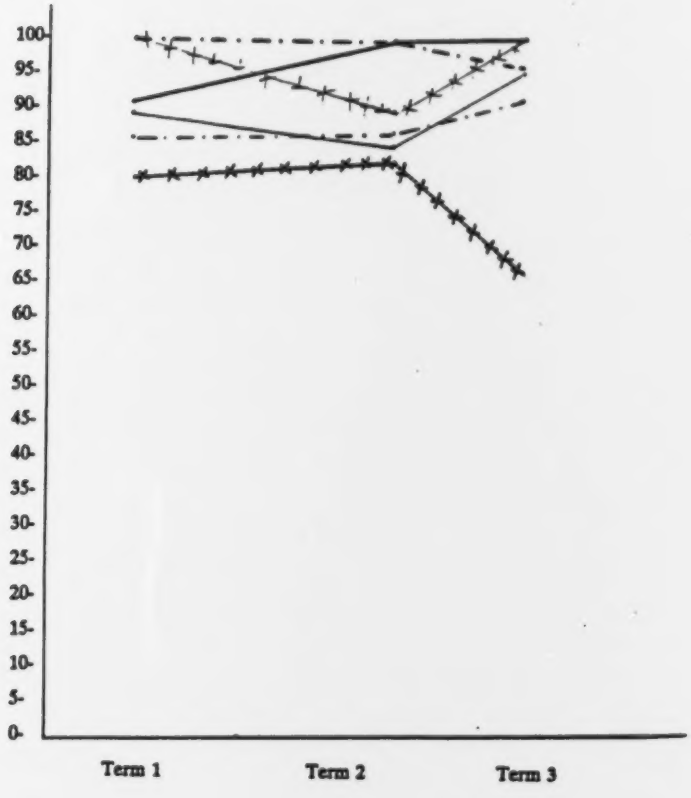
Vic 1988 ——
1989 ✳✳✳
1990 — · —

SA 1988 ——
1989 ✳✳✳
1990 —·—

Items 98 and 99 are negative questions which attempt to isolate the particulr problems which might beset a beginning teacher, namely the time consuming nature of the task and the need to just survive. Hopefully the "very true" and "fairly true" responses would decline throughout the year as the neophyte becomes more able to come to grips with the role, determine priorities and become a part of a larger team.

The six cohorts, apart from the 1989 Victorian cohort, do not respond similarly in these two questions. Apparantly some beginning teachers do not mind being very busy whereas other groups are not so busy but are still struggling to survive, possibly due to the lack of outside professional support. The TCS cast some light on these responses.

Item 100
This period has been a period of growth and development for me

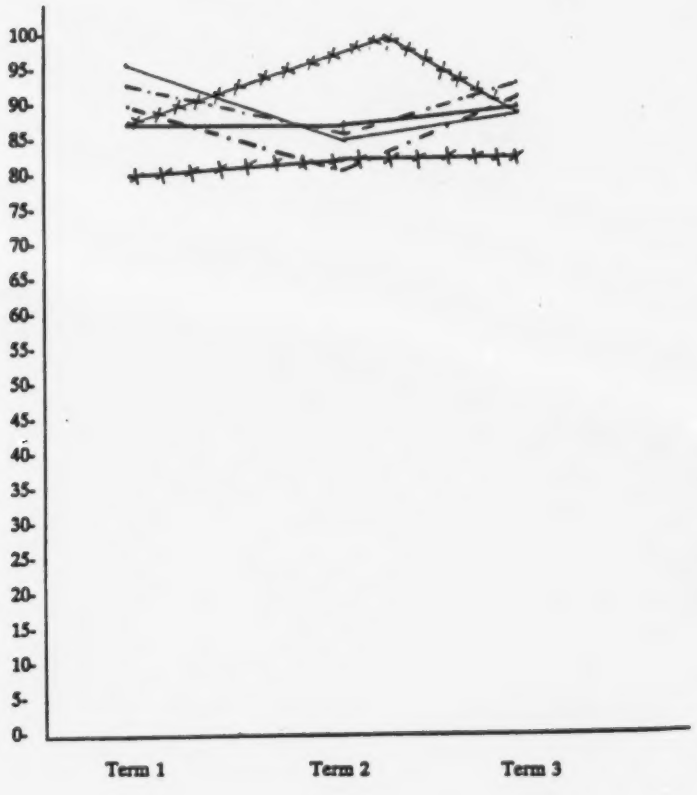


Key

Vic	1988	——	SA	1988	——
	1989	+++		1989	+-+-
	1990	—·—		1990	—·—

Item 100 is a positive question which attempts to gauge the beginning teachers' overall beliefs about their professional progress; some groups revealed a second term slump and a third term revival, apart from the 1989 South Australian cohort. This is an extremely small group (N=5), working across kindergartens, an aboriginal rural school and centre-based child care, and should not be interpreted as a general response by beginning teachers.

Item 101
I think I have performed well in this period of teaching



Key

Vic 1988 ——
1989 *-*-*
1990 — · —

SA 1988 ——
1989 *-*-*
1990 — · —

Item 101, "I think I have performed well in this period of teaching" produced a high positive response from all cohorts, in spite of a typical second term slump in three groups. These responses are encouraging and appear to suggest that the beginning teacher is resilient, resourceful and positive about their commitment to their role and determined to become more adept at their art. This is reflected particuarly in the Fuller TCS responses.

In addition to the quantitative data gathered through the questionnaire, respondents were asked to complete the Fuller: Teachers Concerns Statement developed by Frances Fuller et all in 1969 and modified subsequently. The Teachers Concerns Statement (TCS) is an attempt to determine the initial and subsequent needs of teachers at various stages in their professional development and therefore was thought to be an ideal tool for determining the professional growth of neophyte teachers at all levels of education.

Fuller has argued that teachers' concerns are able to be classified into two categories: concerns about self and concerns about pupils. She has suggested (Fuller et al, 1974) that neophyte, or beginning, teachers are particularly preoccupied about themselves, about their own comfort, adequacy and success as opposed to the comfort, adequacy and success of their pupils. In support of this argument she quotes from discussions with beginning teachers and their concerns about control, mastery of content, the evaluation of supervisors, working conditions and whether or not they are liked by the pupils. While very little is known about the concerns of experienced teachers the available data from USA and UK cited by Fuller indicate that experienced teachers are more likely to be concerned about the benefits to putpils than are inexperienced teachers.

Such concerns about teaching assume some importance if we are to assume that they are expressions of felt need on the part of the developing teachers and could indicate a motivation to undertake relevant learning in order to ameliorate these needs. As a result, these teacher concerns are of considerable interest to those professionals who are involved in the development of neophyte teachers. In other words, an examination of the concerns expressed by neophyte teachers could form the basis for initial inservice training for beginning teachers at any level of education.

She assumed that the concerns would change over time as a result of experience and maturity but that initial concerns would relate to oneself in terms of personal survival, then move to concerns about oneself as a teacher to put pupil needs, and progress to concerns about ways in which they could improve themselves as teachers and as professionals.

Beginning teachers' concerns, then, tend to realte to the "survival" dimension of concerns about the role, concerns about personal adequacy and concerns about whether or not the pupils are learning as a result of their teaching and concerns about the associated teaching and evaluating methods used.

The Fuller material is evaluated on a scale of 0-6, with a score towards the zero end reflecting the "survival" characteristics of teachers, while a score towards the upper end reflects a more altruistic approach to professional concerns. Respondents were asked to take about ten minutes to respond to the question: "When you think about your teaching, what are you concerned about?"

All cohorts across the three years revealed a strong move towards professional maturity by Term 3. In several cohorts the South Australian groups indicated a more mature response initially and a slower move towards maturity than their Victorian colleagues but the size of the group and the presence of several mature age students may have biased the results. In any case, the main purpose of the Fuller was to provide respondants with an opportunity to "flesh out" some of their quantitative responses, and in that respect, the TCS did add an extra, and important, dimension to the study. The South Australian responses have their own particular

flavour, reiterating the respondents desperation to find a tenured or even a contract job, instead of emergency work: "there is a need for inservice and job security", "I'm worried about my job prospects" and the somewhat acerbic comment: "Employment is another area that worries me. Unfortunately many positions are gained when teachers have personal contacts. I wonder how many teachers get their jobs on their own merits".

Other problems which were mentioned on several occasions were the need for more knowledge about behaviour management (called discipline by the South Australians), the complexities of administration, the need to try to find support for children with specific needs and pressures imposed by advisors and parents when the subject of readiness for school is the topic:

> "I need to be able to make a judgement by August about the children who will be ready for school next year - will I be able to do this?"

A number of responses emphasised the lack of community awareness of the value of kindergarten; quotes such as: "they only think we play"; "it concerns me greatly that I constantly have to justify myself as a preschool teacher to people who should recognise its value and purpose"; "I am patronised by other teachers and told 'yes play is important but you can't learn real things from it'", were common while other comments related to the role of the Management Committee in the operation of a kindergarten, the need to work closely with all parents or "how to draw the line between pleasing parents and educating children", and "parents are quick to point out what they don't like rather than what they do like", and the overwhelming task of determining whether or not children should begin school and the lack of professional support available to assist the neophyte in making this decision.

One interesting Term 3 response relating to helping parents to make a decision about school enrolment included the following statement:

> "I am concerned that I may be developing a fairly negative attitude to parents. However, (I'm) confident that having recognised these concerns, I will go on to improve them next year".

Presumably the respondent is referring to improving her concerns rather than the parents. On a more serious note the following quote offers hope for the future :

> "to be honest I have surprised myself often as to what I have achieved thus far considering the diversity of tasks that make up the role of a full time pre-school teacher".

While the Fuller CTS responses do not, in all cases, reflect the quantitative data, they do reflect four major areas of concern for all neophyte early childhood teachers in both South Australia and Victoria. These relate to feelings of lack of awareness

of, and knowledge about school readiness, administration, ("administration isn't just filling in forms you know"), the management of children's behaviour and working with parents. One Victorian respondent mentioned with enthusiasm the inservice program for beginning teachers she undertook at the Lady Gowrie Child Centre ("terrific") and these comments have served to point up the very real needs of beginning teachers in terms of consistent inservice education and on the spot advice and support from a more experienced person who was designated for that task, such as an Advisor. Several respondents commented on the isolation of a single (or even a double unit kindergarten) and/or the problems associated with the professional isolation of operating in a small country town.

Conclusion

The six cohorts of beginning teachers and caregivers sampled in this study revealed a great deal of commonality in responses in each set of responses across both sets of respondents. The quantitative data yielded responses which indicate a positive attitude to job, to the children, colleagues and parents while the qualitative data indicated that the vast majority of respondents wanted to do their best, but above all, survive. Katz (1977) has argued that this survival stage for early childhood teachers and caregivers is a time when the full impact of responsibility for a group of "immature but vigorous children" inevitably provokes teacher anxieties, and there is a perceived discrepancy on the part of the neophyte to anticipate success, thus intensifying feelings of inadequacy and unpreparedness.

Katz has stated that teachers at this stage of development require support, understanding, encouragement, reassurance, comfort and guidance, as well as instruction in specific skills and added insights into the complex causes of behaviour. All these comments are supported by the Fuller data, but Katz adds the rider that "training must be constantly and readily available" from a staff member, advisor or consultant.

Where do we go from here? We have a growing body of literature in Australia and overseas and research documenting the need for a coherent inservice program for beginning teachers and a growing determination on the part of Education Ministries and Departments to abolish advisors and consultants. It seems obvious that there has to be a group of mentors to take the place of those whose role has changed. We need to move quickly to establish this role and enshrine it in the award restructuring process in order to ensure that a whole generation of beginning teachers is not lost to the profession!

Bibliography

Borthwick, Jill (1989) "Construing the Experience of Teacher Education: Mode Constructs and Fuller's Stages of Teacher Concers", paper presented at AARE Conference, Adelaide, November.

Bradley, D. (1989) "Teacher Quality and Career Development", paper presented at Seminar on Teacher Quality and Career Development, Canberra, NBEET, July 10-11.

DEET (1989) Teachers Learning: Improving Australian Schools Through Inservice Teacher Training and Development, Canberra, AGPS.

Ebbeck, F.N. (Chair) (1990) Teacher Education in Australia: Report to the Australian Education Council, SA Office of Tertiary Education, Adelaide, SAGP.

Ebbeck, M.A. & Clyde, M. (1990) "Teacher Development: A Comparative Study of Early Childhood Teachers in Their First Year of Teaching", paper presented at ATEA Conference, Adelaide, July.

Fogarty, Merv and Lennon, Jim (1991) "Conceptions of Teaching during Induction", South Pacific Journal of Teacher Education, Vol 19 (1) pp 43-48.

Fuller, Frances & Case, Carol (1969) Concerns of Teachers: A Manual for Teacher Educators, Texas University, Austin.

Fuller, Frances C. et al (1974) "Concerns of Teachers: Research and Reconceptualisation", paper presented at the 59th Annual Meeting of the American Educational Research Association, Illinois, April (ED 091 439)

Gilding, K. et al (1980) Report of the South Australian Inquiry into Teacher Education, Adelaide, SAGP.

Katz, Lilian G. (1977) Talks with Teachers: Teacher Reflections in Early Childhood Education, NAEYC, Washington.

Lennon, J.W., Aspland, T.L., Fogarty, M.F., Lange, J.D., Mason, G.A., Millwater, J. and Streets, G.R. (1988) "Pen Pictures of Beginning Teachers", Brisbane, Board of Teacher Education.

OECD (1989) The Training of Teachers, Paris, CERI.

Parsons, Jane S. & Fuller, Frances F. (1974) "Concerns of Teachers: Recent Research on Two Assessment Instruments", paper presented at the 59th Annual Meeting of the American Educational Research Association, Illinois, April (ED 093 987)

Smith, R. (1989) "Opening Address", at Seminar on Teacher Quality and Career Development, Canberra, NBEET, July 10-11.

Speedy, G. (Chair) (1989) Discipline Review of Teacher Education in Mathematics and Science, Vol 1, Canberra, AGPS.